



الجامعة السعودية الإلكترونية
SAUDI ELECTRONIC UNIVERSITY
2011-1432

Instructor Lab Manual

OOP: Object Oriented Programming

CS230 - IT232 - CS140



College of Computing & Informatics

SAUDI ELECTRONIC UNIVERSITY



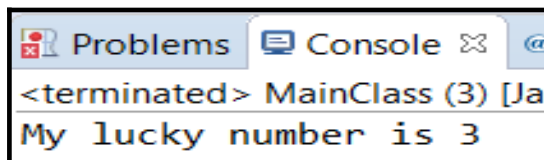
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Week 3 – Week 4

Exercise 1: Lucky number

Write a program that print your lucky number. Name your class LuckyNumber. The output must be as the following:

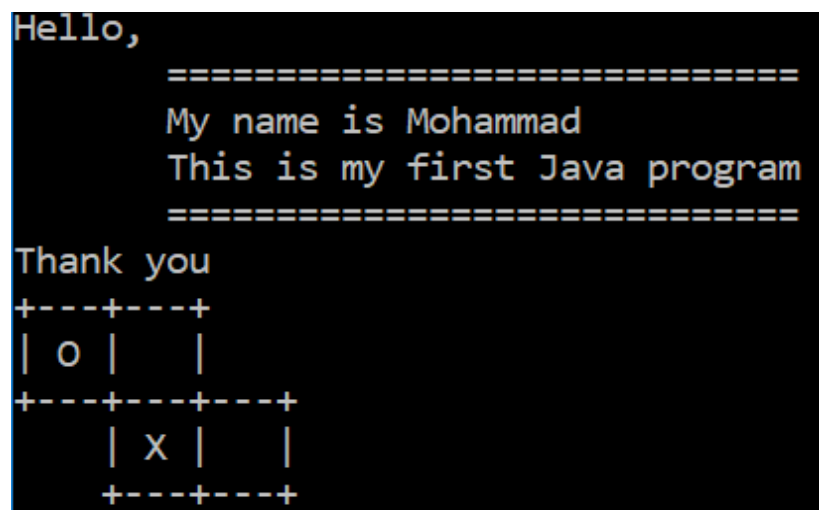


Solution:

```
public class LuckyNumber{  
    public static void main (String []args) {  
        System.out.print("My lucky number is 3");  
    } //end of main  
} // end of class
```

Exercise 2: print information

Write a Java program that prints the following:



Note 1: Change the output so it prints your name in the third line.

Note 2: use \n and \t



Solution:

```
public class Java1
{
    public static void main(String [] args)
    {
        System.out.println();
        System.out.println("Hello,");
        System.out.println("=====");
        System.out.println("My name is Khalid"); //name changed
        System.out.println("This is my first Java program");
        System.out.println("=====");
        System.out.println("Thank you");
        System.out.println("+---+---+");
        System.out.println("| O |   |");
        System.out.println("+---+---+---+");
        System.out.println(" | X |   |");
        System.out.println(" +---+---+");
        System.out.println();
    }
}
```

Exercise 3: multiplication Table

Write a Java program that prints the multiplication table of 9 as the following:

Multiplication table of 9 (1-5)

```
1 * 9 = 9
2 * 9 = 18
3 * 9 = 27
4 * 9 = 36
5 * 9 = 45
```

Solution:

```
public class MultTab
{
    public static void main (String [] arg)
    {
        System.out.println("Multiplication table of 9 (1-5)");
        System.out.println("1 * 9 = " + 1*9);
        System.out.println("2 * 9 = " + 2*9);
        System.out.println("3 * 9 = " + 3*9);
        System.out.println("4 * 9 = " + 4*9);
        System.out.println("5 * 9 = " + 5*9);
    }
}
```



Exercise 4: Hello program!!!

Scanner class in java library is used to read keyboard input.

Write a program that do the following:

- Ask the user to enter his/her full name.
- Read the input and store it in the variable (name)
- Print a welcome message with the user name.

Solution:

```
import java.util.Scanner;
public class Midterm{
public static void main (String[] args){
//Ask the user to enter his/her full name.
System.out.println("Enter your full name");
//Read the input and store it in the variable (name)
Scanner in = new Scanner (System.in);
String name= in.nextLine();
//Print a welcome message with the user name.
System.out.println("Welcome, " + name);
}}
```

Exercise 5: Seconds converter

Write java program that allow the user to enter:

- The number of seconds
- The number of minutes
- The number of hours

Print the corresponding total number of seconds

Typical run of the program

```
BlueJ: Terminated
Options
Enter the number of seconds:
40
Enter the number of minutes:
3
Enter the number of hours:
1
40 seconds + 3 minutes + 1 hours = 3820 seconds
End of the program
```



Solution:

```
import java.util.Scanner;
public class SecondsConverter{
    public static void main (String [] args)    {
        Scanner in = new Scanner(System.in);
        System.out.println("Enter the number of seconds: ");
        int s = in.nextInt();

        System.out.println("Enter the number of minutes: ");
        int m = in.nextInt();

        System.out.println("Enter the number of hours: ");
        int h = in.nextInt();

        int totalSeconds = s + m*60 + h*3600;
        System.out.println(s + " seconds + " + m + " minutes + " + h +
" hours = " + totalSeconds + " seconds" );
        System.out.println("End of the program");
    }
}
```

Exercise 6: SAR bills calculator

Create java program that ask the user to enter an amount in Saudi Riyal.

The program must print the minimum number of bills required to get the given amount.

The program should also print the number within each kind of bill.

Typical run of the program:

Scenario 1:

```
BlueJ: Terminal Window - p12
Options
Give an amount: Saudi Riyal:
6789
The minimum number of bills required for the amount6789 is: 24
500 SR: 13
100 SR: 2
50 SR: 1
10 SR: 3
5 SR: 1
1 SR: 4
Can only enter input while your programming is running
```



Scenario 2:

```
BlueJ: Terminal Window - p12
Options
Give an amount: Saudi Riyal:
2040
The minimum number of bills required for the amount2040 is: 8
500 SR: 4
100 SR: 0
50 SR: 0
10 SR: 4
5 SR: 0
1 SR: 0
Can only enter input while your programming is running
```

Solution:

```
import java.util.Scanner;
public class SarBillsCalculator
{
    public static void main(String [] args)
    {
        Scanner in = new Scanner(System.in);
        System.out.println("Give an amount: Saudi Riyal: ");
        int x = in.nextInt();
        int amount=x;

        int nb_500 = amount/500;
        amount = amount -nb_500 * 500;

        int nb_100 = amount/100;
        amount = amount -nb_100 * 100;

        int nb_50 = amount/50;
        amount = amount -nb_50 * 50;

        int nb_10 = amount/10;
        amount = amount -nb_10 * 10;

        int nb_5 = amount/5;
        amount = amount -nb_5 * 5;

        int nb_1 = amount;
```



```
int totPaper =nb_500+nb_100+nb_50+nb_10+nb_5+nb_1;
    System.out.println("The minimum number of bills required for the
amount" + x + " is: " + totPaper);
    System.out.println("500 SR: "+nb_500);
    System.out.println("100 SR: "+nb_100);
    System.out.println("50 SR: "+nb_50);
    System.out.println("10 SR: "+nb_10);
    System.out.println("5 SR: "+nb_5);
    System.out.println("1 SR: "+nb_1);
}
}
```



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Week 5

Exercise 1:

Write a Java program to get a number from the user and print whether it is positive or negative and if it is odd or even.

Solution:

```
import java.util.Scanner;
public class Ex1 {
    public static void main(String[] args) {
        Scanner in = new Scanner (System.in);
        System.out.println("Please Enter a Number");
        int n = in.nextInt();

        if (n>0)
            System.out.println("This is a positive number");
        else
            System.out.println("this a negative number");

        if(n%2 ==1)
            System.out.println("This is an Odd number");
        else
            System.out.println("this is an even number");
    }
}
```

Exercise 2:

Take three numbers from the user and print the greatest number and the smaller number.

Solution:

```
import java.util.Scanner;

public class Ex2 {
    public static void main(String[] args)

    {
        Scanner input = new Scanner(System.in);
```



```
System.out.print("Kindely enter three numbers (click enter after each number):");
```

```
int num1 = input.nextInt();  
int num2 = input. nextInt ();  
int num3 = input. nextInt ();
```

```
if (num1 >= num3 && num1 >= num2)  
    System.out.println("The greatest number is = " + num1);  
else if (num2 >= num1 && num2 >= num3)  
    System.out.println("The greatest number is = " + num2);  
else  
    System.out.println("The greatest number is = " + num3);
```

```
if (num1 <= num3 && num1 <= num2)  
    System.out.println("The smallest number is = " + num1);  
else if (num2 <= num1 && num2 <= num3)  
    System.out.println("The smallest number is = " + num2);  
else  
    System.out.println("The smallest number is = " + num3);
```

```
}  
}
```

Exercise 3:

Write a Java program that reads two floating-point numbers and tests whether they are the same up to three decimal places.

Solution:

```
//This Mohammed Saffar Code  
import java.util.Scanner;  
public class Ex3  
{  
    public static void main(String[] args)  
    {  
        Scanner input = new Scanner(System.in);  
        System.out.print("Kindely enter two numbers (click enter after each number):");
```



```
double num1 = input.nextDouble();
double num2 = input.nextDouble();

final double PL=1E-3;//=0.001

if (Math.abs(num1 - num2) <= PL)
    System.out.println("Entered numbers are the same up to third
decimal place.");
else
{
    if((num1 - num2)>0)
        System.out.println("Greatest Number = " + num1);
    else
        System.out.println("Greatest Number = " + num2);
}
}
```

Exercise 4:

Write a Java program that reads a floating-point number and prints "zero" if the number is zero. Otherwise, print "positive" or "negative". Add "small" if the absolute value of the number is less than 1, or "large" if it exceeds 1,000,000.

Solution:

```
import java.util.Scanner;
public class Exercise4 {

    public static void main(String[] args)
    {
        Scanner in = new Scanner(System.in);
        System.out.print("Input value: ");
        double input = in.nextDouble();

        if (input > 0)
        {
            if (input < 1)
```



```
{
    System.out.println("Positive small number");
}
else if (input > 1000000)
{
    System.out.println("Positive large number");
}
else
{
    System.out.println("Positive number");
}
}
else if (input < 0)
{
    if (Math.abs(input) < 1)
    {
        System.out.println("Negative small number");
    }
    else if (Math.abs(input) > 1000000)
    {
        System.out.println("Negative large number");
    }
    else
    {
        System.out.println("Negative number");
    }
}
else
{
    System.out.println("Zero");
}
}
}
```



Exercise 5:

Write a Java program to solve quadratic equation: $ax^2 + bx + c = 0$

Solution:

```
import java.util.Scanner;
public class Ex5 {
    public static void main(String[] Strings) {

        Scanner input = new Scanner(System.in);

        System.out.print("Input a: ");
        double a = input.nextDouble();
        System.out.print("Input b: ");
        double b = input.nextDouble();
        System.out.print("Input c: ");
        double c = input.nextDouble();

        double result = b * b - 4.0 * a * c;
        if (result > 0.0) {
            double r1 = (-b + Math.pow(result, 0.5)) / (2.0 * a);
            double r2 = (-b - Math.pow(result, 0.5)) / (2.0 * a);
            System.out.println("The roots are " + r1 + " and " + r2);
        } else if (result == 0.0) {
            double r1 = -b / (2.0 * a);
            System.out.println("The root is " + r1);
        } else {
            System.out.println("The equation has no real roots.");
        }

    }
}
```

Exercise 6 (Extra):

Write a Java program that asks the user to provide a single character from the alphabet. Print **Vowel** or **Consonant**, depending on the user input. If the user input is not a letter (between a and z or A and Z), or is a string of length > 1, print an **error message**.



```
import java.util.Scanner;
public class Ex6 {

    public static void main(String[] args)
    {
        Scanner in = new Scanner(System.in);

        System.out.print("Input an alphabet: ");
        String input = in.next().toLowerCase();

        boolean uppercase = input.charAt(0) >= 65 && input.charAt(0) <=
90;
        boolean lowercase = input.charAt(0) >= 97 && input.charAt(0) <=
122;
        boolean vowels = input.equals("a") || input.equals("e") ||
input.equals("i")
            || input.equals("o") || input.equals("u");

        if (input.length() > 1)
        {
            System.out.println("Error. Not a single character.");
        }
        else if (!(uppercase || lowercase))
        {
            System.out.println("Error. Not a letter. Enter uppercase or
lowercase letter.");
        }
        else if (vowels)
        {
            System.out.println("Input letter is Vowel");
        }
        else
        {
            System.out.println("Input letter is Consonant");
        }
    }
}
```



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Week 6-7

Exercise 1:

Write a java program that ask the user to enter tow **positive** numbers. If the user enter a negative number, then the program keep asking him\her to reenter a positive one. Finally, the program print the sum of the tow numbers.

Typical run of the program

```
Enter the positive number 1:
-12
You entered a negatif number ReEnter The number again
-3
You entered a negatif number ReEnter The number again
17
Enter the positive number 2:
-9
You entered a negatif number ReEnter The number again
12
17 + 12 = 29
```

Solution:

```
import java.util.Scanner;
public class Question1 {
    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        int num1;
        int num2;
        //use do while then change it to while
        System.out.println("Enter the positive number 1: ");
        num1 = in.nextInt();
        while (num1 < 0 ) {
            System.out.print("You entered a negatif number ");
            System.out.println("ReEnter The number again");
            num1 = in.nextInt();
        }
        System.out.println("Enter the positive number 2: ");
        //use do while then change it to while
        num2 = in.nextInt();
        while (num2 < 0 ) {
            System.out.print("You entered a negatif number ");
            System.out.println("ReEnter The number again");
            num2 = in.nextInt();
        }
        System.out.println(num1 + " + " + num2 + " = " + (num1 + num2) );
    }
}
```



Exercise 2:

Write a java program that ask the user to enter his\her grade. The grade must be between 0 and 100, and then print if the user succeed or fail. To succeed the grade must be greater then 60.

Typical run of the program

```
Enter youre grade 0-100:
122
the grade must be between 0 and 100, reenter the correct grade:
-10
the grade must be between 0 and 100, reenter the correct grade:
82
congratulations you passed the course
```

Solution:

```
import java.util.Scanner;
public class Question2 {

    public static void main(String[] args) {

        Scanner in = new Scanner(System.in);
        int grade;

        System.out.println("Enter youre grade 0-100: ");
        grade = in.nextInt();
        /*Use do while then change it to while*/
        while (grade < 0 || grade>100 ) {
            System.out.println("the grade must be between 0 and 100, reenter
the correct grade: ");
            grade = in.nextInt();
        }

        if(grade >=60 )
            System.out.println("congratulations you passed the course");
        else
            System.out.println("you failed the course");
    }
}
```



Exercise 3:

Write a java program, using the while loop, that:

- Ask the user to give a positive number less than 100.
- Print all the numbers from the given number to 200.

Typical run of the program

```
please enter a number between 0 and 100
121
wrong number,enter the number again
The given number must be between 0 and 100
32
32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68
```

Solution:

```
import java.util.Scanner;
public class Question4 {
    public static void main(String[] args) {

        int number;
        Scanner in = new Scanner(System.in);
        System.out.println("please enter a number between 0 and 100");
        number = in.nextInt();
        //use do while then change it to while
        while (number<0 || number>100) {
            System.out.println("wrong number,enter the number again ");
            System.out.println("The given number must be between 0 and 100");
            number = in.nextInt();
        }

        for(int i= number; i<=200; i++)
            System.out.print(i+" ");

    }
}
```

Exercise 4:



Write java program that ask the user to enter a number between 50 and 100 then print all the multiple of 5 from zero to the given number.

Typical run of the program

```
please enter a number between 50 and 100
12
wrong number,enter the number again
The given number must be between 50 and 100
78
0 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75
```

Solution:

```
import java.util.Scanner;
public class Question4 {
    public static void main(String[] args) {

        int number;
        Scanner in = new Scanner(System.in);
        System.out.println("please enter a number between 50 and 100");
        number = in.nextInt();
        //use do while then change it to while
        while (number<50 || number>100) {
            System.out.println("wrong number,enter the number again ");
            System.out.println("The given number must be between 50 and 100");
            number = in.nextInt();
        }

        for(int i= 0; i<=number; i=i+5)
            System.out.print(i+" ");

    }
}
```

Exercise 5:



Write java program that ask the user to enter a number between 50 and 100 then print all the multiple of 5 from the given number to 200.

Typical run of the program

```
please enter a number between 50 and 100
33
wrong number,enter the number again
The given number must be between 50 and 100
86
90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200
```

Solution :

```
import java.util.Scanner;
public class Question5 {

    public static void main(String[] args) {

        int number;
        Scanner in = new Scanner(System.in);
        System.out.println("please enter a number between 50 and 100");
        number = in.nextInt();
        //Use do while then change it to while
        while (number<50 || number>100) {

            System.out.println("wrong number,enter the number again ");
            System.out.println("The given number must be between 50 and 100");
            number = in.nextInt();
        }
        for(int i= number+(5-(number%5)); i<=200; i=i+5)
            System.out.print(i+" ");
        //or
        //for(int i = number; i<=200; i=i+1)
        //    if(i%5==0)
        //        System.out.print(i+" ");
    }
}
```

Exercise 6:



An old men wants to buy a new or an antique car. He wants that the age of the car will be between 0 and 3 years or between 40 and 50 years.

Write a java program that asks the user to give a number that must be between 0 and 3 or between 40 and 50. The program keeps asking the user to give that number until getting a suitable one. Finally, depending on the given number the program print "old car" or "new car".

Typical run of the program

```
Enter the year:
12
year is not applicable, Re-enter:
55
year is not applicable, Re-enter:
-2
year is not applicable, Re-enter:
3
New Car
```

Solution :

```
import java.util.Scanner;
public class Question6 {

    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.println("Enter the year: ");
        int year = in.nextInt();

        //use do while then change it to while
        while(year < 0 || year > 3 && year < 40 || year > 50) {
            System.out.println("year is not applicable, Re-enter: ");
            year = in.nextInt();
        }
        if (year >= 0 && year <= 3) {
            System.out.println("New Car");
        }
        else if (year >= 40 && year <= 50) {
            System.out.println("Old Car");
        }
    }
}
```



Exercise 7:

Write a java program that asks the user to give a number between 1 and 7. Use the "switch" keyword to print the corresponding day. For example, if the user enters number 4, the program will print Wednesday.

Typical run of the program

```
Please give a number between 1 and 7
9
Please give a number between 1 and 7
0
Please give a number between 1 and 7
4
Today is :
Wednesday
```

Solution :

```
import java.util.Scanner;
public class Week6
{
    public static void main(String [] args)
    {
        Scanner in = new Scanner(System.in);
        int nday;
        do
        {
            System.out.println("Please give a number between 1 and 7");
            nday = in.nextInt();
        }while(nday>7 ||nday<1);

        System.out.println("Today is :");
        switch(nday)
        {
            case 1:
                System.out.println("Sunday");
                break;
            case 2:
                System.out.println("Monday");
                break;
            case 3:
                System.out.println("Tuesday");
                break;
            case 4:
                System.out.println("Wednesday");
                break;
            case 5:
                System.out.println("Thursday");
                break;
            case 6:
```



```
        System.out.println("Friday");  
        break;  
    case 7:  
        System.out.println("Saturday");  
        break;  
    }  
}  
}
```

Exercise 8:

Write a java program that act as a simple calculator using the switch statement.

Typical run of the program

```
Choose an operator: +, -, *, or /  
&  
Choose an operator: +, -, *, or /  
*  
Enter first number  
3  
Enter second number  
2  
3.0 * 2.0 = 6.0
```

Solution :

```
import java.util.Scanner;  
  
public class Week6 {  
    public static void main(String[] args) {  
  
        char operator;  
        Double number1, number2, result;  
  
        // create an object of Scanner class  
        Scanner input = new Scanner(System.in);  
  
        // ask users to enter operator  
        do{  
            System.out.println("Choose an operator: +, -, *, or /");  
            operator = input.next().charAt(0);  
        }while(operator!='+' && operator!='-' && operator!='*' && operator!='/');  
        // ask users to enter numbers  
        System.out.println("Enter first number");  
        number1 = input.nextDouble();  
  
        System.out.println("Enter second number");  
        number2 = input.nextDouble();
```



```
switch (operator) {

    // performs addition between numbers
    case '+':
        result = number1 + number2;
        System.out.println(number1 + " + " + number2 + " = " + result);
        break;

    // performs subtraction between numbers
    case '-':
        result = number1 - number2;
        System.out.println(number1 + " - " + number2 + " = " + result);
        break;

    // performs multiplication between numbers
    case '*':
        result = number1 * number2;
        System.out.println(number1 + " * " + number2 + " = " + result);
        break;

    // performs division between numbers
    case '/':
        result = number1 / number2;
        System.out.println(number1 + " / " + number2 + " = " + result);
        break;

    default:
        System.out.println("Invalid operator!");
        break;
}
}
```



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Week 9

Exercise 1:

Write a java program that:

- Create an array of 10 integers.
- Create an array of 5 boolean.
- Create an array of 3 String.
- Print the content of each array.

Typical run of the program

```
Content of the int array
0|0|0|0|0|0|0|0|0|0|

Content of the boolean array
false|false|false|false|false|

Content of the String array
null|null|null|
```

Solution :

```
public class Q1Lab8
{
    public static void main (String [] arg)
    {
        int [] intArray = new int [10];
        boolean [] boolArray = new boolean [5];
        String [] StringArray = new String [3];

        System.out.println("Content of the int array");
        for(int i = 0; i<10; i++)
            System.out.print(intArray[i] + "|");

        System.out.println("\n\nContent of the boolean array");
        for(int i = 0; i<5; i++)
            System.out.print(boolArray[i] + "|");

        System.out.println("\n\nContent of the String array");
        for(int i = 0; i<3; i++)
            System.out.print(StringArray[i] + "|");
    }
}
```



Exercise 2:

Write a java program that:

- Create an array of 10 integers.
- Print the content of the array.
- Change the value of the first element to 11.
- Change the value of the last element to 1.
- Print the content of the array.

Typical run of the program

```
BlueJ: Terminal Wi...
Options
numbers[0] = 0
numbers[1] = 0
numbers[2] = 0
numbers[3] = 0
numbers[4] = 0
numbers[5] = 0
numbers[6] = 0
numbers[7] = 0
numbers[8] = 0
numbers[9] = 0
-----
numbers[0] = 11
numbers[1] = 0
numbers[2] = 0
numbers[3] = 0
numbers[4] = 0
numbers[5] = 0
numbers[6] = 0
numbers[7] = 0
numbers[8] = 0
numbers[9] = 1
Can only enter input while your
```



Solution :

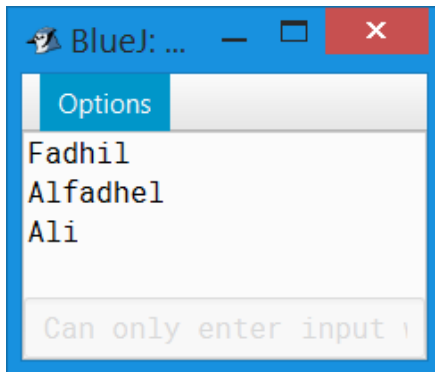
```
import java.util.Scanner;
public class Question2
{
    public static void main(String[] args)
    {
        //Create array of ten integers
        int[] numbers = new int[10];
        //Print content of array
        for(int x = 0; x < numbers.length; x++)
        {
            System.out.println("numbers[" + x + "] = " + numbers[x]);
        }
        //Change value of first element to 11
        numbers[0] = 11;
        //Change value of last element to 1
        numbers[9] = 1;
        System.out.println("-----");
        //Print content of array
        for(int x = 0; x < numbers.length; x++)
        {
            System.out.println("numbers[" + x + "] = " + numbers[x]);
        }
    }
}
```

Exercise 3:

Write a java program that:

- Create an array of 3 String.
- Initialize the first element with your first name.
- Initialize the second element with your last name.
- Initialize the third element with your father name.
- Print the content of the array using **enhanced for loop**.

Typical run of the program



Solution :

```
import java.util.Scanner;
public class Question4
{
    public static void main(String[] args)
    {
        //Create an array of 3 String.
        String[] name = new String[3];
        //Initialize the first element with your first name.
        name[0] = "Fadhil";
        //Initialize the second element with your last name.
        name[1] = "Alfadhel";
        //Initialize the third element with your father name.
        name[2] = "Ali";
        //Print the content of array
        for(String el:name)
            System.out.println(el+ " ");
    }
}
```

Exercise 4:

Write java program that:

- Ask the user to give a number between 2 and 5.
- Create an array of int. The length of the array is equal to the given number.
- Ask the user to fill the array element by element.
- Ask the user to enter a position then print the array content of this position. If the user enters a wrong number, then an exception occurs.

Typical run of the program



```
BlueJ: Terminal Window - p2
Options
Enter the length of the array between 2 and 5:
3
Enter a value for array numbers[0] = 12
Enter a value for array numbers[1] = 6
Enter a value for array numbers[2] = 45
-----
Enter a number of a cell
4
An exception occure
java.lang.ArrayIndexOutOfBoundsException: Index 4 out of bounds for length 3
The position 4 does not exist
End of the exception

Can only enter input while your programming is running
```

Solution :

```
import java.util.Scanner;
public class Question5
{
    public static void main(String[] args)
    {
        Scanner in = new Scanner(System.in);
        int arrLength;

        //Ask the user to give a number between 2 and 5.
        System.out.println("Enter the length of the array between 2 and 5:");
        arrLength = in.nextInt();

        //if the user give a number < 2 or > 5
        while(arrLength < 2 || arrLength > 5)
        {
            System.out.println("The length has to be between 2 and 5, Enter again: ");
            arrLength = in.nextInt();
        }

        //Create an array of int. The length of the array is equal to the given number.
        int[] numbers = new int[arrLength];

        //Ask the user to fill the array element by element.
        for(int x = 0; x < numbers.length; x++)
```



```
{
    System.out.print("Enter a value for array numbers[" + x + "] = ");
    numbers[x] = in.nextInt();
}

System.out.println("-----");

//Print the content of a cell.
System.out.println("Enter a number of a cell");
int pos = in.nextInt();
try
{
    System.out.println(numbers[pos]);
}
catch(Exception e)
{
    System.out.println("An exception occure\n" + e);
    System.out.println("The position " + pos + " does not exist");
}
finally
{
    System.out.println("End of the exception");
}
}
```

Exercise 5:

Write a java program that:

- Create an array of 20 integers.
- Initialize the first element with 20, the second element with 19...the last element with 1.
- Print the content of each array.
- Change the value of the first element to 3 (1*3), the second element to 6 (2*3) ... the last element to 60 (20*3).
- Print the content of the array.

Typical run of the program



```
BlueJ: Terminal Wi...  
Options  
numbers[0] = 20  
numbers[1] = 19  
numbers[2] = 18  
numbers[3] = 17  
numbers[4] = 16  
numbers[5] = 15  
numbers[6] = 14  
numbers[7] = 13  
numbers[8] = 12  
numbers[9] = 11  
numbers[10] = 10  
numbers[11] = 9  
numbers[12] = 8  
numbers[13] = 7  
numbers[14] = 6  
numbers[15] = 5  
numbers[16] = 4  
numbers[17] = 3  
numbers[18] = 2  
numbers[19] = 1  
-----  
numbers[0] = 3  
numbers[1] = 6  
numbers[2] = 9  
numbers[3] = 12  
numbers[4] = 15  
numbers[5] = 18  
numbers[6] = 21  
numbers[7] = 24  
numbers[8] = 27  
numbers[9] = 30  
numbers[10] = 33  
numbers[11] = 36  
Can only enter input while your
```

Solution :



```
import java.util.Scanner;
import java.util.Random;
public class Question3
{
    public static void main(String[] args)
    {
        //Create an array of 20 integers.
        int[] numbers = new int[20];

        //Initialize the first element with 20, the second element with 19, the
        last element with 1.
        //Print elements of the array
        for(int x = 20; x > 0; x--)
        {
            numbers[numbers.length-x] = x;
            System.out.println("numbers[" + (numbers.length-x) + "] = " +
            numbers[numbers.length-x]);
        }

        int mult = 3;

        System.out.println("-----");

        //Change the value of the first element to 3 (1*3), the second element
        to 6 (2*3), the last element to 60 (20*3).
        //Print elements of array
        for(int x = 0; x < 20; x++)
        {
            numbers[x] = 3 * (x+1);
            System.out.println("numbers[" + x + "] = " + numbers[x]);
        }
    }
}
```

Exercise 6:

Write java program that:

- Ask the user to give a positive number between 10 and 20.



- Create an array of integer. The length of the array is the given number by the user.
- Print the content of the array
- Fill the array with numbers from 0 to the given number -1.
- Print the content of the array
- Fill the array with positive random numbers less than 200.
- Print the content of the array.
- Find and print :
 - The odd numbers, the maximum and the minimum numbers.
 - The sum and the average.

Typical output

```
Please give a number between 10 and 20
12
The state of the array before initialization
0 0 0 0 0 0 0 0 0 0 0 0
The state of the array after initialization
0 1 2 3 4 5 6 7 8 9 10 11
The state of the array after random filling
54 48 102 149 102 174 111 99 85 189 35 133
The odd numbers are
149 111 99 85 189 35 133
the sum is :1281.0
the avg is :106.75
the max is :189
the min is :35
```

Solution :

```
import java.util.Random;
import java.util.Scanner;
```

```
public class Numbers {
```

```
    public static void main(String[] args) {
```

```
        int size ;
        double sum = 0;
        int min;
        int max;
        double avg;
        Scanner in = new Scanner(System.in);
```

```
        //get a number from the user
```



```
System.out.println("Please give a number between 10 and 20");
size = in.nextInt();

while(size<10 || size >20 )
{
    System.out.println("Please give a number again between
10 and 20");
    size = in.nextInt();
}

//declaration of the array
int [] ar = new int [size];

//print the content of the array//before
System.out.println("The state of the array before initialize");
for(int i = 0; i< size;i++)
{
    System.out.print(ar[i] + " ");
}
//filling the array
for(int i = 0; i< size;i++)
{
    ar[i]=i;
}
//print the content of the array//after
System.out.println("\nThe state of the array after initialization");
for(int i = 0; i< size;i++)
{
    System.out.print(ar[i] + " ");
}

Random g = new Random();
//fill the array with random number
for(int i = 0; i< size;i++)
{
    ar[i]= g.nextInt(201);
}
//print the content of the array
System.out.println("\nThe state of the array after random
filling");
for(int i = 0; i< size;i++)
{
```



```
        System.out.print(ar[i] + " ");
    }
    //print ....
    System.out.println("\nThe odd numbers are");

    max = ar[0];
    min = ar[0];
    for(int i = 0; i < size; i++)
    {
        if(ar[i] % 2 != 0)
            System.out.print(ar[i] + " ");

        sum = sum + ar[i];

        if (ar[i] > max)
            max = ar[i];

        if (ar[i] < min)
            min = ar[i];
    }

    System.out.println("\nthe sum is : " + sum);
    System.out.println("the avg is : " + sum / size);
    System.out.println("the max is : " + max);
    System.out.println("the min is : " + min);
}
}
```



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Instructor Lab Manual

OOP: Object Oriented Programming

CS230 - IT232 - CS140 - IT401



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Week 10-11

Exercise 1:

- 1) Create a class **Pen** to represent a pen according to the following requirements:
 - a) A pen has two attributes: **id** and **color**.
 - b) Add a **constructor** without parameters. In the initialization of the attributes, set the id to zero and the color to an empty string.
 - c) Add a **constructor** with two parameters to initialize the attributes id and color by a specific values. Use the keyword "this"
 - d) Add the method **setId** that set the id of a pen to a specific value.
 - e) Add the method **setColor** that set the color of a pen to a specific value.
 - f) Add the method **getId** that return the id of a pen.
 - g) Add the method **getColor** that return the color of a pen.
- 2) Create the class **PenTester** with the main method.
 - a) Create two pen **P1** and **P2** using the first constructor.
 - b) Print the characteristics of **P1** and **P2**.
 - c) Create one pen **P3** using the second constructor.
 - d) Change the id of the pen **P3**.
 - e) Print the id of **P3**.

Solution:

```
public class Pen
{
    //instance variables
    private int id;
    private String color;
    //Constructor 1
    public Pen( )
    {
        id = 0;
        color = "";
    }
    //Constructor 2
    public Pen(int id, String color)
    {
        this.id = id;
        this.color = color;
    }
    //methods
    public void setColor(String w)
    {
        color = w;
    }
}
```



```
public void setId(int w)
{
    id = w;
}

public int getId()
{
    return id;
}
public String getColor()
{
    return color;
}
}
class PenTester
{
    public static void main(String []args)
    {
        //create p1
        Pen p1 = new Pen();
        System.out.println("the id of p1 is " +p1.getId());
        System.out.println("the color of p1 is " +p1.getColor());

        //create p2
        Pen p2 = new Pen();
        System.out.println("the id of p2 is " +p2.getId());
        System.out.println("the color of p2 is " +p2.getColor());

        //create p3
        Pen p3 = new Pen(13,"Bleu");
        System.out.println("characteristics of p3 before changes");
        System.out.println("the id of p2 is " +p2.getId());
        System.out.println("the color of p2 is " +p2.getColor());

        p3.setColor("red");
        p3.setId(123);

        System.out.println("characteristics of p3 after changes");
        System.out.println("the id of p1 is " +p3.getId());
        System.out.println("the color of p1 is " +p3.getColor());

    }
}
```



Exercise 2:

- 1) Create a class **BankAccount** to represent a bank account according to the following requirements:
 - a) A bank account has three attributes: accountnumber, balance and customer name.
 - b) Add a **constructor** without parameters. In the initialization of the attributes, set the number and the balance to zero and the customer's name to an empty string.
 - c) Add a **constructor** with three parameters to initialize all the attributes by specific values.
 - d) Add a **constructor** that allow to initialize the balance at a given number and the customer's name with empty string and the account number by zero.
 - e) Add all the required setter methods
 - f) Add all the required getter methods
 - g) Add the method withdraw
 - h) Add the method deposit
 - i) Add the method reset that change the balance to zero
- 2) Create a tester class. In the main method:
 - a) Create one bank account using the first constructor and print its characteristics.
 - b) Create one bank account using the second constructor and print its characteristics.
 - c) Create one bank account using the third constructor and print its characteristics.
 - d) Deposit 1000 in each bank account.
 - e) Withdraw 500 from the first bank account, 200 from the second one.
 - f) Change the customer's name of the third account.

Solution:

```
public class BankAccount
{
    private int accountnumber;
    private int balance;
    private String customername;

    public BankAccount( )
    {
        accountnumber = 0;
        balance = 0;
        customername = " ";
    }
}
```



```
public BankAccount(int x, int y, String z)
{
    accountnumber = x;
    balance = y;
    customername = z;
}

public BankAccount(int y)
{
    accountnumber = 0;
    balance = y;
    customername = "  ";
}

public void setAccountNum(int x)
{
    accountnumber = x;
}

public void setBalance(int x)
{
    balance = x;
}

public void setCustomerName(String x)
{
    customername = x;
}

public int getAccountNum()
{
    return accountnumber;
}

public int getBalance()
{
    return balance;
}

public String getCustomerName()
{
    return customername;
}
```



```
        public void withdraw(int x)
        {
            balance = balance - x;
        }

        public void deposit(int x)
        {
            balance = balance + x;
        }

        public void reset()
        {
            balance = 0;
        }
    }

    public class BankAccountTester
    {
        public static void main(String []args)
        {
            BankAccount Account1 = new BankAccount();
            System.out.println("Account1 Number "
+Account1.getAccountNum());
            System.out.println("Balance " + Account1.getBalance());
            System.out.println("Customer Name " +
Account1.getCustomerName());

            System.out.println("-----");

            BankAccount Account2 = new BankAccount(111, 999, "Turki");
            System.out.println("Account2 Number "
+Account2.getAccountNum());
            System.out.println("Balance " + Account2.getBalance());
            System.out.println("Customer Name " +
Account2.getCustomerName());

            System.out.println("-----");

            BankAccount Account3 = new BankAccount(7777);
            System.out.println("Account3 Number "
+Account3.getAccountNum());
            System.out.println("Balance " + Account3.getBalance());
```



```
        System.out.println("Customer Name " +
Account3.getCustomerName());

        System.out.println("-----");
        System.out.println("After Changes");
        System.out.println("-----");

        Account1.Deposit(1000);
        Account2.Deposit(1000);
        Account3.Deposit(1000);

        Account1.Withdraw(500);
        Account2.Withdraw(200);

        Account3.setCustomerName("Majed");

        System.out.println("Account1 Number "
+Account1.getAccountNum());
        System.out.println("Balance " + Account1.getBalance());
        System.out.println("Customer Name " +
Account1.getCustomerName());

        System.out.println("-----");

        System.out.println("Account2 Number "
+Account2.getAccountNum());
        System.out.println("Balance " + Account2.getBalance());
        System.out.println("Customer Name " +
Account2.getCustomerName());

        System.out.println("-----");

        System.out.println("Account3 Number "
+Account3.getAccountNum());
        System.out.println("Balance " + Account3.getBalance());
        System.out.println("Customer Name " +
Account3.getCustomerName());

    }

}
```



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Week 12

Exercise 1:

Create a class "**Student**" and another class "**Teacher**", both descendants of "**Person**".

The class "**Student**" will have a public method "**GoToClasses**", which will write on screen "I'm going to class."

The class "**Teacher**" will have a public method "**Explain**", which will show on screen "Explanation begins". Also, it will have a private string attribute "**subject**".

The class "**Person**" must have two methods:

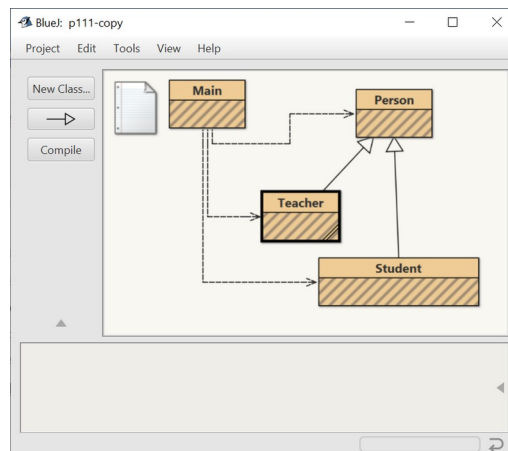
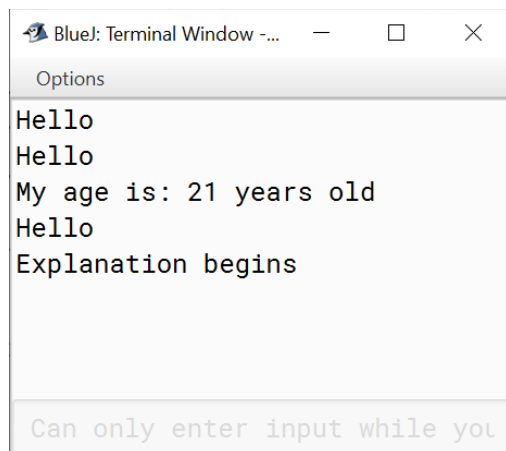
- a method "**SetAge (int n)**" which will indicate the value of their age (eg, 20 years old).
- A method "**Greet**" which will show on screen "Hello".

The student will have a public method "**ShowAge**" which will write on the screen "My age is: 20 years old" (or the corresponding number).

You must create another test class called "**StudentAndTeacherTest**" that will contain "**main**" method and:

- Create a Person and make it say hello
- Create a student, set his age to 21, tell him to Greet and display his age
- Create a teacher, 40 years old, ask him to say hello and then explain.

Typical run of the program



Solution:

```
public class Person
```

```
{
```

```
    protected int age;
```

```
    public void Greet()
```

```
    {
```

```
        System.out.println("Hello");
```

```
    }
```

```
    public void SetAge(int n)
```

```
    {
```

```
        age = n;
```

```
    }
```

```
}
```

```
public class Teacher extends Person
```

```
{
```

```
    private String subject;
```

```
    public final void Explain()
```

```
    {
```

```
        System.out.println("Explanation begins");
```

```
    }
```

```
}
```



```
public class Student extends Person
```

```
{  
    public void ShowAge()  
    {  
        System.out.printf("My age is: %s years old" + "\n", age);  
    }  
}
```

```
public class Main
```

```
{  
    public static void main(String[] args)  
    {  
        //Create a Person and make it say hello  
        Person myPerson = new Person();  
        myPerson.Greet();  
  
        /*Create a student, set his age to 21,  
        tell him to Greet and display his age*/  
        Student myStudent = new Student();  
        myStudent.SetAge(21);  
        myStudent.Greet();  
        myStudent.ShowAge();  
  
        /*Create a teacher, 40 years old,  
        *ask him to say hello and then explain*/  
        Teacher myTeacher = new Teacher();  
        myTeacher.SetAge(40);  
        myTeacher.Greet();  
        myTeacher.Explain();  
    }  
}
```

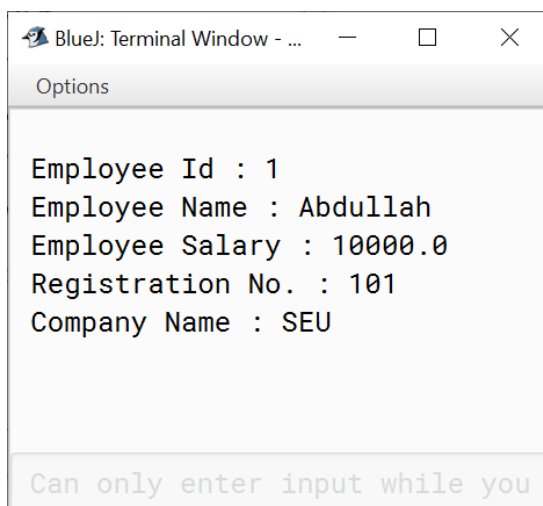


Exercise 2:

Write a java program to depict the use of **super** keyword to invoke the overridden methods and to invoke a superclass's constructor.

- Create a class **Employee** with 3 data members **Id**, **Name**, **Salary** and define a parameterized constructor to initialize this data.
- Create the method **void PutData()** in this class to print all the data.
- Create a derived class **Company** with two data items **Cname** and **RegNo**.
- Create a constructor in the derived class to initialize all the data items from both the child as well as the super class using the **super** keyword.
- Override the **PutData()** in Company to print the **Cname** and **RegNo** and also call the **PutData()** of the base class to print the details of the Employee using **super** keyword.
- Write the main method to invoke the appropriate methods.

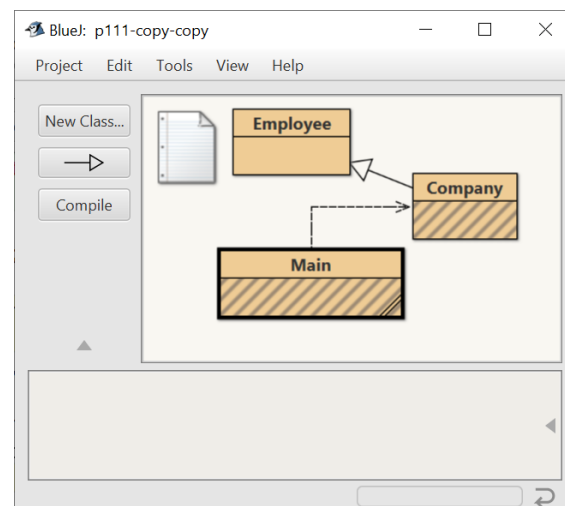
Typical run of the program



```
Blue: Terminal Window - ...
Options

Employee Id : 1
Employee Name : Abdullah
Employee Salary : 10000.0
Registration No. : 101
Company Name : SEU

Can only enter input while you
```



Solution:

class Employee



```
{
    int Id;
    String Name;
    double Salary;

    Employee (int id, String name, double salary)
    {
        Id = id;
        Name = name;
        Salary = salary;
    }
    void putData()
    {
        System.out.print("\n Employee Id : " + Id);
        System.out.print("\n Employee Name : " + Name);
        System.out.print("\n Employee Salary : " + Salary);
    }
}

class Company extends Employee
{
    int RegNo;
    String CName;

    Company(int regno, String cname, int id, String name, double salary)
    {
        super(id, name, salary);

        RegNo = regno;
        CName = cname;
    }
    void writeData()
    {
        System.out.print("\n Registration No. : " + RegNo);
```



```
        System.out.print("\n Company Name : " + CName);  
    }  
}  
class Main  
{  
    public static void main(String args[])  
    {  
        Company C = new Company(101,"SEU",1,"Abdullah",10000);  
        C.putData();  
        C.writeData();  
    }  
}
```